

## FACTORING HINTS

- Always "take out" greatest common factors. (Remember: There may not always be a GCF)  
 ex.  $2x^3 - 8x^2 + 6x$   
 $2x(x^2 - 4x + 3)$  - this can be factored again to  $2x(x-1)(x-3)$ .
- Count the number of terms

A. **Two terms:** Use formula if possible (think squares or cubes)

### Difference of Squares

$$1) x^2 - y^2 = (x - y)(x + y)$$

ex.  $4x^2 - 9 = (2x - 3)(2x + 3)$   
 $(2x)^2 - (3)^2$

### Sum of Square

$$2) x^2 + y^2 = \text{Prime}$$

ex.  $4x^2 + 9$  (Cannot be factored; therefore, it is prime)

### Difference of Cubes

$$3) x^3 - y^3 = (x - y)(x^2 + xy + y^2)$$

ex.  $8x^3 - 27y^3 = (2x - 3y)(4x^2 + 6xy + 9y^2)$

### Sum of Cubes

$$4) x^3 + y^3 = (x + y)(x^2 - xy + y^2)$$

ex.  $64x^3 + 1 = (4x)^3 + 1^3$   
 $(4x + 1)(16x^2 - 4x + 1)$

B. **Three terms:** You may use one of two different methods: Trial & Error or AC Method.

ex. **Trial & Error**

$$2x^3 - 8x^2 + 6x$$

$$2x(x^2 - 4x + 3)$$

$$2x(x - 1)(x - 3)$$

$$2x(x - 3)(x - 1)$$

-- step 1 above ("take out" common factors)  
 -- split up the  $x^2$   
 -- decide on the signs  
 -- split up the 3 (the last term) you must check with FOIL

For examples using the AC Method, please refer to our "Factoring Trinomials (AC Method)" handout.

C. **Four terms:** Grouping

ex.  $5x^2 + 2x + 10x + 4$   
 $(5x^2 + 2x) + (10x + 4)$  --divide into 2 groups  
 $x(5x + 2) + 2(5x + 2)$  --factor each group separately (the inside of the parenthesis should be the same otherwise that will change the grouping)  
 $x(5x + 2) + 2(5x + 2)$  --factor again  
 $(5x + 2)(x + 2)$  -- factor out (5x+2)  
 $(5x + 2)(x + 2)$  --check with FOIL

ex.  $6x^2 + 3x - 8x - 4$   
 $(6x^2 + 3x) - (8x + 4)$  -- a negative in the middle means change the 2<sup>nd</sup> sign.  
 $3x(2x + 1) - 4(2x + 1)$  -- factor each group separately  
 $(2x + 1)(3x - 4)$  -- factor out the (2x + 1)  
 Check with FOIL

The grouping can be changed and the results will stay the same.

$$6x^2 - 8x + 3x - 4$$

$$2x(3x - 4) + 1(3x - 4)$$

$$(3x - 4)(2x + 1)$$

--factor each group separately  
 --factor out the (2x + 1)  
 Check with FOIL